The American FERTILIZER

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The American FERTILIZER

Vol. 110 MAY 14, 1949 No. 10

Improving Soil Productivity in Temperate Climates

By W. G. OGG

Rothamsted Experimental Station, Harpenden, England

This paper will be presented and discussed on Thursday, August 25, 1949, at the session on "Land" of the United Nations Scientific Conference on the Conservation and Utilization of Resources, to be held at Interim Headquarters of the United Nations, Lake Success, N. Y. Other sessions will be held from August 17 to September 6, further details of which will be found elsewhere in this issue.

Agricultural conditions and farming practices, even when we are considering only the regions of temperate climate, are very varied and the methods employed to improve soil productivity must, of necessity, also vary widely.

During the past century, agricultural research has thrown light on many of the reasons for traditional practices and has led to vast improvements in old methods and to the introduction of new ones. The result has been an enormous increase in food production in many parts of the world and the pressure of increasing populations makes further increases essential, particularly in regions where productivity is still low.

It is not the purpose of this conference to discuss the details of the researches which have made these advances possible but rather to consider their wider application to practice. Some of the more recent discoveries are only beginning to be applied and it is desirable to expedite the process; others have long been successfully used in some regions and we ought to study the possibilities of extending their application to others.

My aim, therefore, is to review briefly certain scientific advances and successful techniques under the following headings: the study and mapping of the different classes of soils, draining and irrigation, cultivation, systems of farming, liming and manuring.

The Study and Mapping of the Different Classes of Soils

There is within the temperate and warm temperate zones a wide range of soils, some of which differ fundamentally from others and the world has learned to its cost that soil treatments and systems of agriculture suited to one class may be totally unsuited to another For instance, much land belonging to the chernozem soil group has been brought under cultivation only within the past century and the early settlers applied the agricultural practices to which they had been accustomed in dealing with podzolic and brown forest soils. These turned out to be quite unsuitable and this lack of understanding has been one of the causes of the soil erosion that has ruined so much of the rich land of the world.

Apart from causing soil erosion, faulty soil

management is responsible for low output in many regions. Satisfactory agricultural systems and soil management techniques have been developed for many soil types but full use cannot be made of this information until much more soil survey work has been carried out. The need for soil surveys is particularly great in undeveloped territories.

In some countries, notably the United States, the soil survey is well advanced, but in others there is very little knowledge of the types of soil or of their distribution. Without this knowledge it is impossible to make adequate use of the existing information regarding the maintenance and improvement of soil fertility. The carrying out of soil surveys is, therefore, one of the most urgent tasks and the necessary foundation for other advances. In order to facilitate the establishment of soil surveys where they do not exist at present, soil surveyors might be loaned during the early stages by countries with experienced staffs.

In the existing state of knowledge in soil surveying there is also need for the soil types found in the different countries to be correlated so that the information obtained in one country can be applied in others. The names applied to the main world groups of soils are fairly well standardized internationally but the types within these world groups often have local place names which carry no significance in other countries.

Draining and Irrigation

Over much of the earth's surface, agricultural production is limited through either an excess or a deficiency of water in the soil. Removal of the excess through drainage is still an art rather than a science but physics and engineering have already contributed a good deal and will in future contribute more to the solution of drainage problems. Further research is needed to determine more accurately the depth and distance apart at which drains should be placed. At the present time high labour costs deter many farmers who fully realize the necessity for draining their land and there is a great need for further mechanization to reduce the labour required in excavating and filling-in trenches and laying tiles.

In many places, satisfactory drainage of individual farms and individual fields is impossible until large-scale regional schemes, which are the business of the State or local authorities, have been undertaken.

The productivity of very large areas of land in many countries could be greatly increased by carrying out regional schemes and by encouraging individual farmers, by means of subsidies and by loaning or hiring labour-saving machines to drain their farms.

There are also very large areas, particularly in warm temperate regions, where lack of water is the limiting factor and where productivity could be increased enormously through irrigation. Irrigation in many cases raises difficult problems through the accumulation of soluble salts. Much experience is now available on suitable methods of irrigation but many countries which would benefit most from irrigation lack this experience. Invaluable assistance could be given in such cases if irrigation experts could be loaned in order to start new schemes on the right lines.

As in the case of drainage, irrigation work falls into two classes, regional and local. The regional schemes again are the province of large organizations or the State but local schemes could be encouraged by subsidies, loans and the provision of technical advice and help.

Cultivation

Research work at Rothamsted and elsewhere on the movement of moisture in the soil has shown that after rain, when surplus water has drained away the remaining water moves very slowly and over quite short distances. This knowledge throws a fresh light on the effects of cultivation on soil moisture. A great deal of hoeing and inter-row cultivation, for instance, is done in the belief that the dry surface layer produced checks the evaporation of moisture from the soil. It has been shown, however, that this does not materially reduce the amount of water which evaporates from the soil surface and that the benefits obtained are largely due to the destruction of weeds which compete with the crop for water and plant food. Even seedling weeds take up a great deal of plant food and have a markedly depressing effect on crop yields, particularly on soils of low fertility.

There has been much controversy in recent years on the relative merits of ploughing and surface cultivations, but it is a generally accepted fact that the cultivation processes must differ according to soil, climate and system of farming. In view of the fact that cultivation is one of the costliest items in crop production, every unnecessary operation should be eliminated and modern weed-killers may reduce the need for certain cultiva-

tion operations where the primary object is weed control.

The tractor has opened up new possibilities in cultivation, particularly in the case of very heavy soils. It has made possible deeper cultivations and the carrying out of cultivations in a short space of time when the soil is in its most suitable condition and it has reduced costs. Smallholders and peasant farmers, however, frequently cannot afford to keep tractors and modern cultivation equipment on their small areas of land and cultivation is often done in an unsatisfactory and uneconomical way. Under these circumstances soil productivity could be increased and the living standards of peasant farmers raised if there were facilities for having cultivation done by contract and if tractors and implements were available on a hire system, thereby enabling production to be intensified. In Britain during the war, machinery depots have been run under Government auspices and also by private contractors, and many farmers, large and small, have made much use of these facilities and continue to do so. The result has been an improvement in the standards of cultivation in many places and an increase in food production.

Systems of Farming

One of the most important factors in the maintenance and improvement of soil fertility is the employment of appropriate systems of farming. The practice of growing the same crop year after year on the same piece of land is still common in many places and, under certain conditions of soil and climate and with adequate manuring, crop yields can be maintained at a high level for many years. This has been demonstrated on Broadbalk field at Rothamsted where wheat has been grown continuously for over a century—though not with a view to encouraging the practice. The drawbacks to the system are obvious. It concentrates the risks of farming, there is a continuous drain on the same plant nutrients, the land is apt to become weedy, the incidence of certain plant diseases is increased and in some regions soil structure is destroyed and erosion occurs.

Monoculture has, fairly generally, been superseded by crop rotations and in places which have been farmed for long periods, systems of rotation have been evolved by the process of trial and error. Rotations often include at least one root crop, to facilitate the destruction of weeds, and one or more years of grass. Unsuitable or too-short rotations may bring about serious outbreaks of disease due to soil-borne fungi and other organisms such as eelworms.

In some cases, the cropping rotation is confined to one portion of the farm and the remainder is permanent pasture. This system was usual in many parts of England but in recent years an increasing number of farmers have been bringing all or most of their land under regular rotation with beneficial results. The compulsory ploughing up of much permanent pasture for cropping during the war encouraged this change of system and it has led to a marked increase in productivity. Much of the permanent pasture was inferior in quality to temporary pasture and the arable crops following the temporary pasture also benefited.

More experimental work on systems of rotation is urgently required but there is already evidence to show that in many regions a regular rotation system which includes two or more years under grasses or leguminous crops is very advantageous, particularly for the improvement of soil structure.

Soil productivity could also be increased in many places if more attention were given to the seeds mixtures used in laying down pastures. The selection of efficient pasture legumes is an important factor in raising the fertility of poor soils. The introduction of wild white clover in Britain, for instance, led not only to remarkable improvements in the pastures themselves but also to increased yields in the subsequent crops. In Australia, the use of subterranean clover has increased the productivity of pastures directly, and has also provided a means of building up the fertility of soils initially poor in nitrogen so that they can support more productive grass species, and later can be brought into profitable arable cropping. Much information regarding pasture seeds mixtures suitable for various conditions of soil and climate already exists and greater effort should be made to have it applied.

In many regions livestock play a great part in promoting high productivity—the manurial residues not only providing plant nutrients but stimulating the micro-biological life of the soil and improving its structure and texture. On this subject, again, more research is required.

The drain made by weeds on soil moisture and plant nutrients is not adequately recognized. Even seedling weeds, as already mentioned, are important and the system of farming followed ought to be one which enables weeds to be kept down to the minimum. Much progress has been made in recent years on the control of weeds by

chemical methods and in many places crop yields could be greatly increased at little cost by means of these selective weed-killers.

Liming

There are certain soil types in temperate regions, particularly those belonging to the podzol group, which under natural conditions have not a sufficiently high lime status for many agricultural crops. These types cover an enormous area and systematic liming is, as a rule, necessary for satisfactory crop production. It is often necessary to lime such soils when they are reclaimed for agricultural use and afterwards lime has to be applied from time to time to compensate for the amount taken up by the crops and lost through drainage. At the same time, it must be borne in mind that over-liming is detrimental and that soils ought to be tested before lime is applied.

Although these facts are well-known, many farmers neglect the liming of their soils and this is often one of the chief limiting factors in crop production. In Britain, for instance, it was estimated before the war that more than half the land urgently required liming and in an attempt to remedy this, a subsidy scheme was introduced by which the State pays half the cost of liming. A survey of lime resources was carried out and new sources of liming materials were opened up to increase supplies and reduce transport costs. As a result of the scheme, greatly increased quantities have been used. In the interval, however, more land has been brought under cultivation and even now the amounts being applied are scarcely keeping pace with the losses and there are still great areas of acid soils which need liming. A similar state of affairs exists in many other countries and if systematic liming could be stimulated where it is required there would be a marked increase in the world's food supplies. Not only would crop yields be increased but quality would be improved and the health of animals would benefit. The following means are suggested:

1. The carrying out of soil acidity surveys in order to draw attention to the needs and to provide farmers with information as to the quantities of lime they should apply.

2. The provision of adequate supplies of liming materials as near as possible to the farms on which they are to be used. Because of the bulky nature of such materials and the quantities required, transport often constitutes a considerable proportion of the cost with the result that land far from the sources of supply is often neglected. In some countries this difficulty has been overcome by offering preferential transport rates.

3. The encouragement of liming by propaganda and, if necessary, by subsidies.

Manuring

During the last two hundred years, the very great increase in population, concentrated largely in towns, and modern systems of sanitation, have brought the world face to face with numerous new problems with regard to food.

The soil must be repaid for what is taken out of it. On the credit side we have the gradual weathering of rock particles, the fixation of nitrogen by micro-organisms, the decay of plant and animal remains and the farmyard manure and compost we return to the soil. On the debit side we have what is removed as agricultural produce, most of which goes as domestic sewage into rivers and the sea, and over much of the temperate region we have also the losses through soil drainage. The supply of natural organic manures is quite inadequate and without fertilizers we could not possibly balance the budget under present-day conditions.

Organic manures are of very great importance and fulfil certain functions which fertilizers do not. For instance, they increase the water-holding and nutrient-holding properties of the soil and improve its texture and structure. Efforts should therefore be made to conserve every possible ton of natural organic manure and to prevent loss in the manure heap. In most parts of the world a large amount of liquid manure is allowed to run to waste, especially on dairy farms. This should be avoided as far as possible and in this connection the technique of collection and application employed in Denmark might advantageously be followed.

A good deal of research has also been done in recent years on the recovery of sewage for manurial purposes and useful sewage sludges are on the market in many places. It is highly important that this recovery of sewage should be extended.

Fertilizers

Since the introduction of fertilizers just over a century ago, a great deal of knowledge has been built up regarding their use. The fundamental work done by Lawes and Gilbert at Rothamsted has been supplemented and extended by experiments in many parts of the world and although it is difficult to get an exact measure of the effect of fertilizers in

(Continued on page 26)

World Conference on Conservation

United Nations to Assemble Scientists at Lake Success for First World-Wide Discussion on Utilization of Land and Other Natural Resources

A WORLD conference on the conservation of such natural resources as soil, forests, minerals, water, fuels and power is being organized by the United Nations. This meeting which has been named the United Nations Scientific Conference on the Conservation and Utilization of Resources (UNSCCUR) will hold its sessions at the United Nations interim headquarters, Lake Success, N. Y., during the three-week period beginning August 17, 1949 and ending September 6, 1949.

The ultimate aim of this conference is the enrichment of human life. The immediate program of the conference is to take the first step in a world mobilization of the resource techniques and know-how, one of the essentials in bringing this enrichment to reality.

In beginning this mobilization, UNSCCUR will draw from the talents, techniques and experience of scientists and experts from all over the world. These scientists and experts will exchange ideas and pool their information on how the earth's resources can best be used for the improvement of living standards for everyone. The discussions will be carried out against the background of an urgent need for increased use of resources demanded by a rapidly growing world population.

UNSCCUR is the first scientific conference to be convoked by the United Nations. One of the unique aspects of the conference is that missions to it will represent not governments but the science and technology of economic development. It marks the first time that scientists and engineers from all parts of the globe have been called to gather around a conference table to help each other build a better world through improved means of harnessing resources.

Soil erosion, floods, and crop failures are problems that know no frontiers. Similarly, new means of drawing riches from the earth—from creating new plant and animal hybrids to improving methods of mineral discovery—are goals common to all countries.

But no country has a monopoly of the best methods of solving these problems and attaining these goals. UNSCCUR has been organized on the basis that every part of the world has contributions to make in this regard. And at this conference, experts will have an opportunity to increase their store of knowledge and apply to their own countries the new techniques which they learn from experts from other lands. This store of scientific and practical knowledge is in itself one of the world's great resources—one that grows with use and is enlarged by sharing.

The fullest possible mobilization of this knowledge is considered essential to equip the nations of the world for the task of raising and maintaining the living standards of their people. UNSCCUR is intended as a step in that mobilization.

Conference Participants

The primary concern of the conference is with the practical application of science to resource management and human use, rather than with minute refinements in research and scientific methodology. The resolution of the Economic and Social Council which recommended the conference stresses the "economic costs and benefits of improved resources techniques and the importance of their "widespread application" as well as the need for "the continuous development" of the techniques themselves.

To serve these purposes, the Council decided that the conference should call upon the experience of "engineers, resource technicians, economists and other experts in related fields."

The Secretary-General has issued invitations to experts from 77 countries—the 58 member nations plus the 19 nations which participate in the regional economic commissions of the United Nations. Each of these countries was invited to send missions of experts to UNSCCUR, the personnel of each mission to be selected by the invited governments.

In addition, the Secretary-General has issued invitations to experts to prepare scientific papers on the conference. The Secretary-General, with the aid of a Preparatory Committee, selected 160 outstanding individual scientists to prepare papers for the conference. Invitations to prepare an additional 490 such papers were issued to governments or organi-

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Principal Articles in This Issue

Radioactive Materials Fail To Increrse Crop Output

BY U. S. JONES AND C. DALE HOOVER

TO FIND out whether atomic energy in the form of radioactive alphatron, radium, and uranium would increase crop yields, two experiments were carried out by the Mississippi Agricultural Experiment Station last year. Experiments involving the fertilizing of corn and cotton with small amounts of the radioactive materials failed to show any beneficial or detrimental effect upon either crop growth or quality.

Confidential restrictions on these studies have been lifted recently so that farmers may be aware of the results of these experiments when buying fertilizer this spring. Release of this information was necessary as certain interests have advocated addition of these radioactive materials to fertilizers.

Findings of the Mississippi Experiment Station with regard to corn and cotton plus experiments in 13 other states on 16 other crops do not justify recommendations that farmers use this radioactive material in fertilizers.

Three radioactive materials were used in the field experiments. The commercial material, alphatron, was used at rates of 5, 10, and 20 pounds per acre. This material is said by the manufacturer to have an alpha ray disintegration rate of 8 million per pound per second, largely from actinium. The second material that was used was radium. It was applied as radium bromide and as used contained 30 micrograms of radium per pound. The third material used was uranium which was applied as uranyl nitrate.

The carrier of all three of these materials was dolomite which was used on all check plots in an amount corresponding to the amount applied in the treatment getting the largest amount of alphatron. The amounts of radium and uranium used in these experiments were calculated to give the same number of alpha disintegrations per unit of experimental area as is given in the 10-pound rate of alphatron. The alphatron was added to the soil at three different rates and each rate with ten replications in the various field tests to insure dependable results. Other materials were added to the soil in only one concentration, comparable to the medium concentration of alphatron, but with the same number of replications.

These widespread one-season field experiments indicate strongly that the farmer can-

not expect increased yields from money invested in radioactive materials.

The scientists carrying on these tests caution against confusing this study with the use of radioactive isotopes as tracers in the study of soils, fertilizers, and nutrition of plants. As a research tool, radioactive isotopes are proving valuable, they say, and soils problems associated with the ammoniation of superphosphate will be investigated using radioactive phosphorus at Mississippi State College next year.

Fertilizer "Mistake" Pays Dividends

Arthur and Myron Dowd made a mistake of applying 500 pounds per acre too much fertilizer to a newly seeded alfalfa field back in 1945, but it was a mistake that has paid dividends, according to a story in a recent issue of *Prairie Farmer*.

Farming in Van Buren county, Michigan, they had intended applying 500 pounds of 0-20-20 per acre to the newly seeded alfalfa. Using a new machine to apply the fertilizer, they failed to make the right adjustment and applied 1,000 pounds per acre.

The alfalfa made a lush growth that fall. In the spring the alfalfa-brome mixture "shot up." The first cutting made one and one-half tons per acre. The second cutting was not made in that first year.

After the first cutting of alfalfa in 1947, which yielded two tons per acre, the Dowd brothers applied 400 pounds of 0-12-12 per acre. The second cutting produced one and one-half tons per acre.

The first cutting of 1948 yielded three tons per acre. Again the brothers applied fertilizer this time 500 pounds 0-20-20 per acre. A second cutting made two tons per acre.

Their alfalfa is not running out as is customary in their section of Michigan, but looks like it would be productive for several more years. They intend to keep on feeding it after the first cuttings, replacing in fertilizer what the hay crops remove.

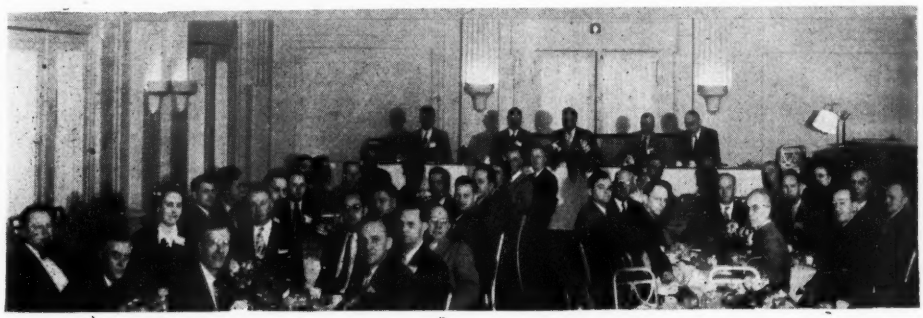
During the three years they have removed a total of 10 tons of choice alfalfa hay per acre. On a similar plot that has had much the same treatment except for the 500 "extra" pounds of fertilizer at seeding time, the present stand of alfalfa is only a third as good.

Voters Approve Mississippi Nitrogen Plant

The voters of Yazoo County, Mississippi, have approved a bond issue of $750,000 to be used to aid in constructing a multi-million dollar plant for the manufacture of fertilizer nitrogen. Another $3,000,000 has been raised by Mississippi farmers for this project, which will be run by the Mississippi Chemical Corporation, of Jackson. According to Owen Cooper, vice-president of the company, plans are being prepared for early construction of the plant.

Miami Fertilizer

The Miami Fertilizer Co. which formerly had its offices in Dayton, Ohio, has recently completed a new office building at its plant in Xenia, Ohio. The new company address is The Miami Fertilizer Co., Trebein, Xenia, Ohio. Its telephones are Xenia 2370 and 2371. By having its offices adjoining the factory, operations have been greatly simplified and better service can be rendered to their customers.



Members of the American Agricultural Editors Association entertained by the National Fertilizer Association at a breakfast on May 5th. At the speakers' table, left to right: C. L. Mast, "Agricultural Leaders Digest," AAEA secretary-treasurer; Ray Yarnell, "Capper's Farmer," AAEA president; Russell Coleman, NFA president; Berry Akers, "The Farmer," AAEA vice-president; D. S. Murph, NFA secretary-treasurer

New N.F.A. Pasture Booklet

The National Fertilizer Association has issued a new 16-page pamphlet entitled "Protein Through Forage" which emphasizes the need for quality pasturage in order to get quality production of meat, eggs, dairy products, etc. With eight full-page illustrations the booklet makes an attractive mailing piece. Included is a table of recommendations for fertilizer treatments on late fall and winter grazing crops, prepared by the Georgia Agricultural Experiment Stations. A copy of this booklet may be obtained by writing to the Association Offices, 616 Investment Building, Washington 5, D. C.

Link-Belt Promotes Craig, Perry and Kolar

Link-Belt Company has announced the following promotions:

Allan Craig, sales manager of the company's southeastern division since 1945, with headquarters in Atlanta, is being transferred to Houston, Tex., in the capacity of general manager of the southwestern division, where a new Link-Belt plant is about to be opened.

Michael J. Perry, district manager at Moline, Ill., since 1946, has been appointed sales manager, southeastern division, with headquarters at the Atlanta plant, to succeed Mr. Craig in that capacity.

Andrew K. Kolar, district sales engineer at Moline, Ill., since 1947, has been appointed district manager, in full charge of that office.

Mr. Craig started his Link-Belt career in 1923, in the engineering department of the company's Philadelphia plant. Mr. Craig gained his initial engineering training at Drexel Institute of Technology.

Mr. Perry started in 1922, in the engineering department of the Pershing Road plant in Chicago. He studied mechanical engineering at Armour Institute (now I. T. T.) and business management at Northwestern University.

Mr. Kolar joined the Pershing Road plant in 1935 in the capacity of shop apprentice upon graduation from Purdue in mechanical engineering. Successively, he has served in shipping, foundry, steel shop, machine shop, rate setting, production, construction, sales and engineering departments.

March Sulphate of Ammonia

Production of by-product sulphate of ammonia during March increased almost 10 per cent over February, totaling 74,657 tons. An additional 4,461 tons was manufactured by the same producers from purchased synthetic ammonia. For the first quarter of 1949, the output of both the above types amounted to 229,391 tons, compared with 214,706 tons during the first quarter of 1948. Shipments during March were 8 per cent greater than production. Consequently stocks on hand at producers' plants had dropped to 14,333 tons by the end of the month.

	Sulphate of Ammonia From By-Product Ammonia	From Purchased Ammonia	Ammonia Liquor
Production	Tons	Tons	Tons NH_3
March, 1949....	74,657	4,461	2,086
February, 1949..	68,020	3,936	1,965
March, 1948....	68,758	2,296	2,090
Jan.–March, 1949	216,668	12,723	6,207
Jan.–March, 1948	208,049	6,657	6,174
Shipments			
March, 1949....	80,776	4,650	1,701
February, 1949..	72,239	4,028	1,342
March, 1948....	79,098	2,269	2,139
Stocks on Hand			
March 31, 1949..	14,333*		481
Feb. 28, 1949....	21,041		695
March 31, 1948..	21,098		742

*Includes small amount from purchased ammonia.

FERTILIZER MATERIALS MARKET

NEW YORK

No New Price Changes on Nitrogen Materials Reported. Supply Still Short and Present Production Contracted For. Organics Market Firmer. Heavy Shipments of Superphosphate Reported at End of Season. Potash Prices for Next Year Show Practically No Change.

Exclusive Correspondence to "The American Fertilizer"

NEW YORK, May 11, 1949.

Sulphate of Ammonia

Demand continued good but no new offerings were available as producers were sold ahead on contract. No new price changes have been announced.

Nitrate of Soda

While the imported material was not too easy to obtain, domestic producers have increased their production and are able to supply their trade. Demand continued good from the South for top dressing.

Ammonium Nitrate

Demand continued good and producers were able to fill buyers' needs better than six months ago as some producers have increased their production. The supply situation was better than at this time last year.

Nitrogenous Tankage

No price changes were noted here, with material for quick shipment scarce.

Organics

The organic fertilizer materials market was slightly firmer as buyers filled in their needs for the end of the season and many manufacturers found themselves short of certain organics, mostly low grade materials. Blood and tankage continued to sell at $8.00 ($9.72 per unit N), f.o.b. eastern production points, with most of the material going to the feed trade. Soybean meal held around $60.00 per ton, f.o.b. Decatur, Ill., and cottonseed meal in bags sold at $60.00 per ton, f.o.b. southern mills. Linseed meal eased off slightly in price and in some quarters prices were heard as low as $56.00 per ton, f.o.b. Minneapolis.

Castor Pomace

Producers were not inclined to offer this material due to the uncertainty of production. Last sales made at $21.00 per ton, f.o.b. production points. A good demand exists for quick shipment with no offerings.

Fish Meal

Fish scrap for summer shipment has been reported sold at $138.00 per ton and fish meal at $145.00 per ton, with most of the material going to the feed trade. Material for quick shipment has sold as high as $200.00 per ton with little offered. Some imported fish meal recently arrived from abroad.

Bone Meal

This material still remained scarce with practically no offerings due to the small domestic production. Some imported material was offered for shipment from abroad but this was mostly feeding bone meal.

Hoof Meal

Little change was noted in this material with sales at around $7.00 per unit of ammonia ($8.51 per unit N), f.o.b. production points

Superphosphate

Buyers took heavy supplies over the last few weeks to fill out their season's requirements and stock piles were said to have dwindled considerably. Triple superphosphate was moving well at steady contract prices. No new prices for next season have been announced yet.

Potash

Several producers have announced prices for the coming year with no changes except that the granular material has been advanced slightly. No further arrivals of imported material were reported. Producers are shipping material as fast as produced on present contracts.

PHILADELPHIA

Demand for Materials Continues. Some Reduction in Price for Spot Materials. Superphosphate Supply Adequate. New Potash Prices.

Exclusive Correspondence to "The American Fertilizer"

PHILADELPHIA, May 9, 1949.

Demand for raw materials is fairly active but not at premium prices. Deliveries of mixed fertilizers are about completed for this season.

Sulphate of Ammonia.—While production is increasing, shipments are mainly against contracts and demand continues ahead of supply. Some producers are reported behind in their shipping schedule. The few resale lots that now come on the market are on a level quite below premium prices previously ruling.

Ammonium Nitrate.—Movement is mostly against contracts with a fair demand for additional quantities at normal prices.

Nitrate of Soda.—Deliveries against contracts keep well up with the trade requirements and the market continues in a tight position.

Blood, Tankage, Bone.—The blood and tankage market continues to ease off with not much buying interest shown by the feeding trade. Present offerings are on the basis of $7.50 to $7.75 per unit of ammonia ($9.12 to $9.42 per unit N) per ton. Bone continues in very limited supply, with production mainly under contract. Some steamed bone has been offered at from $68.00 to $75.00 per ton. Hoof meal is nominal at $7.00 per unit of ammonia ($8.51 per unit N).

Castor Pomace.—Production is reported cut back and entirely under contract. There is quite some inquiry for prompt shipment but the market is without offerings.

Fish Scrap.—Offerings are extremely limited and then at premium prices. The outlook is reported not too hopeful.

Phosphate Rock.—At present the demand seems able to take good care of production with no abnormal accumulation of stocks. It is suggested that increased production abroad may in due time create a highly competitive situation here.

Superphosphate. — Increased demand has kept movement fairly regular and prevented building up of inventories. No price changes are reported and there is no evidence of pressure to sell.

Potash.—Prices for sulphate of potash and sulphate of potash-magnesia have been announced for the season June 1, 1949 to May 31, 1950, and they are practically same as last season. The potash demand continues strong and market position is tight.

CHARLESTON

Shipments of Fertilizers to Farms about Over. Some Organics Sold for Future Delivery. Strikes Hamper Phosphate Production.

Exclusive Correspondence to "The American Feritilizer"

CHARLESTON, May 9, 1949.

Movement of mixed fertilizers to the farms in the southeast is practically over for the season. Potash demand continues heavy and stocks at the mines tight. Superphosphate apparently is sufficient in quantity with the exception of temporary shortages only in certain areas of the Midwest.

Organics.—A fair quantity of organics has been sold for nearby summer and fall shipment to the fertilizer trade. Until recently, a good grade nitrogenous tankage was available at $2.90 per unit of ammonia ($3.53 per unit N), in bulk f.o.b. shipping point but the price of various nitrogenous tankages now varies from $3.00 to $4.00 per unit of am-

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monia ($3.64 to $4.86 per unit N), f.o.b. production points, with only one producer willing to book fall shipment.

Castor Pomace.—Producers of castor pomace are fully committed for supplies in sight, with contracts running through summer. The market is nominally $21.00 per ton, f.o.b. northeastern shipping points, with movement only against contract commitments.

Dried Ground Blood.—The Chicago market is easy, with offers available at $7.25 per unit of ammonia ($8.82 per unit N) in bulk for delivery in the Chicago area. The New York market is around $8.00 per unit ($9.72 per unit N), f.o.b. production point.

Potash.—Demand continues strong at high level with stocks still tight. Seven potash mines in British Zone of Germany are operating and an eighth mine is expected to go into operation shortly. K_2O content produced for 1948 was 260,000 tons as compared with 199,000 tons in 1947.

Phosphate Rock.—Strikes during the latter part of April and first few days in May at the mines affected movement, but in the last few days settlement of all but two of the strikes has been reached. Demand continues steady and prices are firm, subject only to reductions due to decreased cost of oil.

Superphosphate.—Demand continues strong and price is firm. In certain areas of the midwest there are shortages due to heavy demand and also due to strikes at the phosphate rock mines.

Sulphate of Ammonia.—Demand in the southeast for immediate and prompt shipment of sulphate of ammonia has tapered off as a result of lack of demand for fertilizers on the part of the farmers. Manufacturers are not anxious to carry over supplies. Prices, however, remain firm.

Ammonium Nitrate.—Prices remain firm and demand continues steady.

CHICAGO

Organics Market Still Active but Little Future Buying Reported. Prices Show Few Changes.

Exclusive Correspondence to "The American Fertilizer"

CHICAGO, May 9, 1949.

The market on animal ammoniates in this area remains practically unchanged and there is still a good demand and the volume of trading is keeping pace with production. Producers are inclined to sell material somewhat farther ahead but buyers are still confining their interest to nearby deliveries for quick turnover.

Meat scraps still range from $110.00 to $115.00 per ton and digester tankage is quoted approximately $2.00 per ton less.

Dry rendered tankage is moving at $2.05 to $2.10 per unit of protein, f.o.b. shipping points, and in some instances where the haul is not too long, the price is delivered. Dried blood might be called a little easier with offerings at $7.25 per unit of ammonia ($8.82 per unit N) and buyers expressing views of not over $7.00 ($8.51 per unit N). Wet rendered tankage, however, remains fairly firm at $8.00 to $8.50 per unit of ammonia ($9.72 to $10.33 per unit N), depending upon quality and location.

Steamed bone meal is listed at $75.00 per ton and raw bone meal at $5.00 to $10.00 per ton lower.

February Superphosphate Production

Superphosphate was produced in greater quantity during February than in any month since last May. Production figures for February reported to The National Fertilizer Association and a summary of figures submitted to the Bureau of the Census totaled 856,000 equivalent short tons (18% A.P.A. basis), an increase of 16,000 tons (approxi-

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mately 2 per cent) over the January output. As compared with production during February 1948, however, the current figures represent a drop of about 52,000 tons or 5 per cent. The February output brought total production for the first two months of this year to 1,696,000 tons, roughly 138,000 tons below the corresponding figure for last year. Exceptionally large stocks on hand at the beginning of the year combined with the first two months' production brought total supplies to more than 3,000,000 tons, enabling superphosphate producers to dispose of close to 1.9 million tons through the end of February. Shipments during this period totaled 1.1 million tons, the remaining 800,000 tons having been used by the reporting plants in the making of mixed goods. Of the 856,000 tons turned out during February, more than 87 per cent was normal (18% A.P.A.) and 12 per cent was in the form of concentrated (45% A.P.A.) superphosphate. Wet base goods accounted for less than 1 per cent of the total. These proportions were about the same as in January.

	Normal 18% A.P.A.	Concentrated 45% A.P.A.	Base Goods 18% A.P.A.
Production	Tons	Tons	Tons
February, 1949.....	747,246	41,319	5,384
January, 1949.....	737,704	39,064	4,912
February, 1948.....	799,627	36,480	7,044
Jan.–Feb., 1949.....	1,484,950	80,383	10,296
Jan.–Feb., 1948.....	1,635,977	70,460	12,067
Shipments and Used in Producing Plants			
February, 1949.....	900,847	44,504	10,940
January, 1949.....	758,851	42,526	4,919
February, 1948.....	831,816	38,160	8,048
Stocks on Hand			
February 29, 1949...	1,059,757	64,034	9,177
January 31, 1949....	1,204,868	67,219	14,211
February 29, 1948...	903,067	68,096	11,862

New Hough Literature

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Potash Deliveries for First Quarter Show Slight Increase

A total of 563,244 tons of potash salts containing an equivalent of 293,037 tons of K_2O was delivered during the first quarter of 1949 by the five major American producers, according to the American Potash Institute. This represents an increase of 2 per cent in salts and 0.2 per cent in K_2O over the corresponding period in 1948. Deliveries for agricultural purposes in the United States, Canada, Cuba, Puerto Rico, and Hawaii consisted of 530,411 tons of potash salts equivalent to 272,714 tons of K_2O as compared to 264,020 tons K_2O in the first three months of 1948. Muriate of potash predominated with 236,487 tons K_2O, whereas 18,443 tons were delivered as sulphate of potash and sulphate of potash-magnesia, and 17,783 tons as manure salts. Deliveries for chemical purposes totaled 27,704 tons of salts equivalent to 17,197 tons K_2O, a decrease of 29 per cent under the corresponding period a year earlier. Exports to other than Institute countries amounted to 5,130 tons of potash salts containing 3,127 tons K_2O, a decrease of 25 per cent under 1948.

POTASH DELIVERIES

Short Tons K_2O

(United States, Canada, Cuba, Puerto Rico, Hawaii)

	Jan.–Mar., 1949	Jan.–Mar., 1948
Muriate.....	236,487	223,892
Manure Salts.....	18,443	20,598
Sulphate & Sul. Pot. Mag.....	17,783	19,530
Total Agricultural	272,713	264,020
Chemical Potash..	17,197	24,312
Export (Other Countries).....	3,127	4,156
Grand Total.....	293,037	292,488

Boron Deficiencies Cause Damage

Shortages of boron may be responsible for some crop damage being blamed on insects and diseases, say researchers at Virginia Experiment Station.

Dr. G. Myron Shear, plant physiologist, who has made studies of the effect of boron on such crops as apples, alfalfa, rutabaga and cabbage, says shortages of the element can show up in many ways, none of them good.

In alfalfa, some of the common symptoms of boron-deficiency are yellowing of the leaves, stunted plants, decreased yields. The buds may grow to look like small rosettes. In the past, farmers have thought yellowing of the leaves was caused by an insect, the leafhopper. And in many cases it may be. If, however, alfalfa is grown on one of Virginia's boron-deficient soils, that's probably the reason.

Farmers now are being advised to apply fertilizer containing boron to alfalfa. The fertilizer should contain enough boron to furnish 10 to 20 pounds per acre. It is available commercially.

Dr. Shear says his research indicates that boron-deficiencies in alfalfa are likely to show up more often in the last cuttings, and that they seem to have some definite relation to weather. Dry weather appears to intensify the shortages.

Although symptoms in apples vary with the different varieties, some of them may be corky spots in the fruit, bruised looking skins, dieback on the branches. If these symptoms occur in your orchard, contact your county agent.

Boron deficiencies in Virginia's apple orchards are widespread, but spotty, Dr. Shear says. That is, an orchard may have a deficiency one season, and not the next. Here again weather is one of the factors affecting boron shortages.

Experiments a few years ago in southwest Virginia, where rutabagas are produced for commercial markets, showed that boron applications reduced "watercore" in the crop. Watercore, first brought to the attention of the researchers in 1943, showed up as a water-soaked area in the center of the rutabaga root. The size of the area varied from a small spot to almost the entire root.

Dr. Shear says that the cost of boron applications to control watercore is so small that farmers who grow rutabagas in an area where the disorder is widespread cannot afford to use a fertilizer without boron.

He says borax, applied before seeding, at the rate of 10 pounds per acre should satisfactorily control watercore.

WORLD CONFERENCE ON CONSERVATION

(Continued from page 11)

zations asking them to select appropriate authors. Of the total 650 invitations to prepare papers sent to 65 countries, more than 320 acceptances from 30 countries have been received so far.

Individual invitations to attend the conference have been issued by the Secretary-General to authors of conference papers, and he will issue, upon notification, invitations to other persons selected as part of the missions whose attendance is arranged by the invited governments.

Finally, the Secretary-General is authorized to issue invitations to non-governmental organizations, other interested international organizations and learned societies to send representatives to the conference. Organizations to be so invited will be selected with the aid of the Preparatory Committee. The Secretary-General will issue individual invitations to the persons selected by such organizations as well as to other distinguished individual experts selected with the aid of the Preparatory Committee on as wide a geographical basis as possible.

Conferees, no matter how selected, will participate in the conference as individual experts and not as representatives of their governments or organizations.

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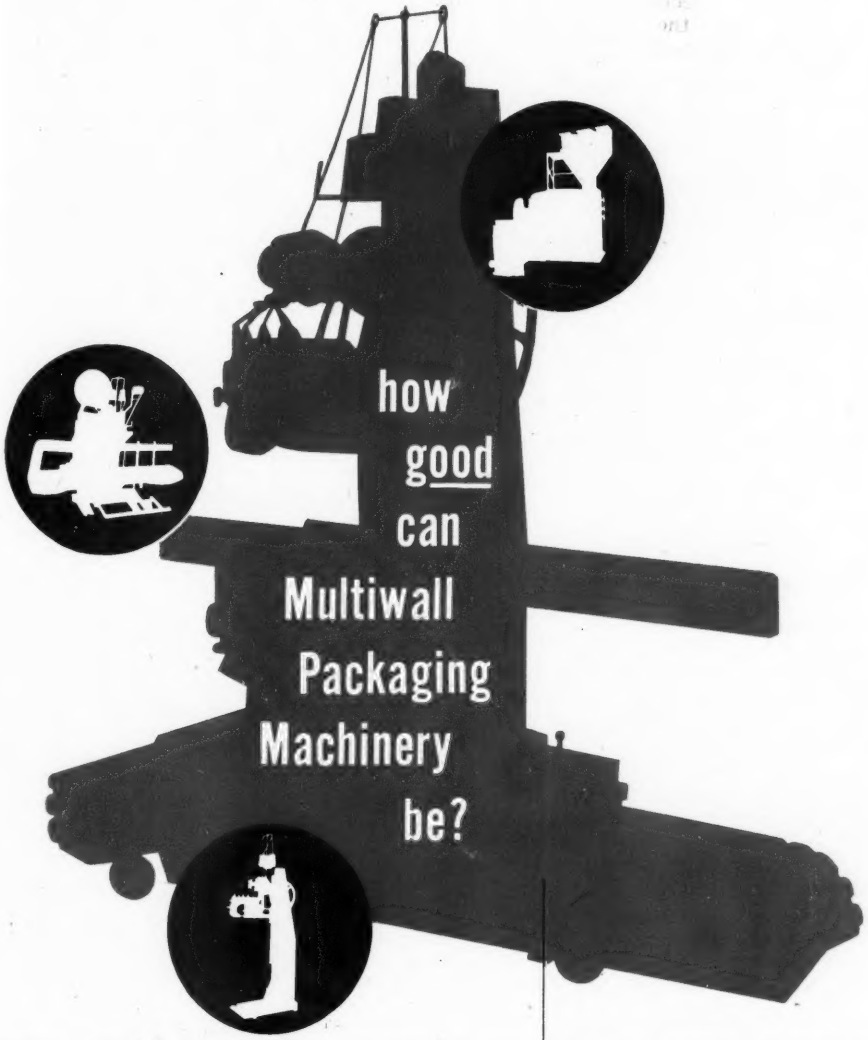

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bind governments nor will it make recommendations to them.

It also is unique in international conferences in the number of related sciences and fields of technology which will be represented at the conference. Scientists and technicians in a large number of fields—from ornithology to geology—will be represented at the conference.

Solving a basic food problem, or bringing about effective utilization of even a single resource calls for not one science but many. Thus, at the conference, the knowledge of numerous related sciences on a single problem will be brought into full play so that complete and not partial solutions can be facilitated. Many of the problems on the use and conservation of resources will be tackled from the viewpoint of the engineer, the doctor, the agronomist, the botanist, the geologist and from the views of expert specialists in a wide variety of directly related fields.

For example, the problem of soil erosion in a certain area may require medical advice to wipe out malaria, prevalent in the area, so that manpower can be effectively used there. Engineering techniques may be required to provide electric power for the area.

But the building of a hydro-electric plant on a nearby river may be adequate in itself. The energy that can be produced may lack users, and soil erosion may choke the rivers and fill the reservoirs. However, if at the same time, factories are built to use part of the power, an irrigation project set up that will need energy to pump water, and a railway or highway built to haul farm products to market and provide ready access to commercial fertilizers, the revenue resulting may permit a soil program that will prevent the value of the power plant from being destroyed. In this way, the combined development may make a great contribution to the national standard of living.

UNSCCUR will discuss overall solutions to such connected problems.

Specific attention to this method of conserving and utilizing resources will be paid at the conference. The conference will devote approximately half of its program to this "inter-relation" of resource techniques, through plenary meetings on subjects of general interest to scientists, technicians, economists, and resource administrators, whatever their special field.

Schedule of Meeting

The first two days, August 17th and 18th, will be devoted to general sessions at which the general world conservation picture will be reviewed. Beginning Friday, August 19th, sectional meetings will be held each morning to discuss specific problems dealing with different phases of the subject.

Of particular interest to the fertilizer industry will be the sectional meetings on land which are scheduled as follows:

August 19—Methods of Soil Conservation
August 22—Soil Programs
August 23—Soil Surveys and Research
August 24—Aids to Farming
August 25—Improving Soil Productivity, Use of Lime and Fertilizers
August 26—Inorganic Fertilizers
August 29—Cropping Systems
August 30—Livestock Breeding
August 31—Livestock and Crop Policy
August 31—New Land Opportunities
September 5—Farming Systems and Soil Conservation
September 2—Plant Breeding
September 2—Grazing Lands
September 5—Protection of Crops and Grassland
September 5—Restoration of Grazing

The conference will be conducted, by means of simultaneous interpretation, in English and French, and in the other official languages—Spanish, Russian and Chinese—as far as is practical and necessary to accommodate conference participants.

Lawns Respond to Fertilizer Mixed with 2, 4-D

Studies in practical lawn maintenance at Plant Industry Station, Beltsville, Md., are showing the value of a combination of fertilizer and 2,4-D in controlling weeds, according to a report of Dr. Fred V. Grau of the U. S. Golf Association, and Ray Knight, grounds superintendent.

A weedy grass, they point out, is a starved grass. So plant food is of first importance. The specialists recommend applications of approximately 400 pounds per acre of 10–6–4 fertilizer to which about four pounds of the sodium salt form of 2,4-D has been added. They advise use of the ready-mixed preparation because of the difficulty in getting the 2,4-D thoroughly mixed.

Best time to apply the fertilizer-weed killer is when the ground is dry and both grass and weeds are growing actively. Application can be made through April and again in September. Get the material on uniformly, the specialists urge. Even distribution is one of the main factors in effectiveness.

A note about clover is timely. The weed killer in this mix will suppress clover temporarily but will not kill it.

IMPROVING SOIL PRODUCTIVITY

(Continued from page 10)

increasing food production, there is ample evidence that it is very great. The results of certain long-term experiments at Rothamsted and elsewhere, for instance, indicate that a moderate dressing of fertilizers has led to an increase in yields of more than one-third over a crop rotation compared with dung alone. Further evidence has been obtained from a statistical study by Crowther and Yates in 1941 of all the published results of one-year fertilizer experiments conducted since 1900 in Great Britain and other northern European countries on the main arable crops.

Among the points brought out by this comprehensive survey are:

1. Fertilizers bring about a very marked increase in crop yields. In the case of nitrogen, a dressing of 0.25 cwt. gives average responses of 20 per cent in grain crops and just over 20 per cent without dung and 12 per cent with dung in root crops. A dressing of 0.50 cwt. P_2O_5 gives only a small increase in grain crops but swedes give a response in the absence of dung of from 20 per cent to 50 per cent. Potatoes and mangolds how about half the response and sugar beet less. In the case of potash, potatoes give the greatest response,

0.50 cwt. K_2O giving an increase of 18 per cent in the absence of dung and six per cent when dung is present. Swedes (*Brassica Rutabaga*) and mangolds are somewhat less responsive and sugar beet and cereals still less.

2. In most cases, apart from phosphate and potash on cereals, greater responses can be obtained by heavier dressings than those just quoted and the most efficient or most profitable can be calculated by taking into account such factors as cost of fertilizers and value of crop. It must, of course, be recognized that climatic and soil conditions affect the responses and the amounts it may be desirable to apply.

3. It was found that on dunged land phosphatic fertilizers gave about one-half and potash fertilizers about one-third of the crop increase obtained on undunged land but the need for nitrogen was unchanged. It appears that the dung enables crops to respond profitably to much more nitrogen than dung itself can supply.

4. Fertilizer applications should be adjusted to the cropping. It was shown that the limited supplies of phosphate and potash available in Britain in war-time could be used much more profitably by applying them to responsive crops such as potatoes and withholding them altogether from cereals, than by dividing them between all crops.

Although a good knowledge of the principles of manuring exists, there is the question how far this knowledge is applied in farming practice. In order to obtain information on this point, a Survey of Fertilizer Practice is being carried out in England by the National Agricultural Advisory Service in co-operation with Rothamsted.

From this it would appear that fertilizer practice varies a great deal in different parts of the country. This is to be expected because of the wide differences in types of farming and in soil and climatic conditions. There is, however, more in it than that. There are farmers in every district who are backward in their use of fertilizers and there are also whole districts backward compared with others. Generally speaking, the traditionally arable regions use more adequate amounts of fertilizers than the dairying and cattle raising regions and they also differentiate between the needs of different crops. Another point brought out is a widespread failure to recognize the special needs of old grassland, so much of which was ploughed up during the war. It has been assumed that such land has large reserves of plant food and requires little or no fertilizer whereas it is often very deficien in lime and phosphate. The manuring of grassland in most parts of the country is quite inadequate and this is probably true in many parts of the world. During the war this was, perhaps, inevitable, but even in peace-time it was neglected.

The fertilizer survey has also shown that the manuring of crops varies very much with the size of farm. The large and better educated farmers appear to be in close touch with the Advisory Service and to realize more fully the value of fertilizers, whilst those who most need advice are least inclined to seek it.

The fertilizer consumption per acre of arable land shows very great differences in different countries and the variation seems to be generally in accordance with the general intensity of farming and with the proportion of market gardening. Before the war, Holland used five times, Belgium three times and Germany over twice as much fertilizer per arable acre as Britain and the average yields in Holland and Belgium were much greater than those in Britain. Although these higher yields could not be attributed entirely to heavier manuring, this no doubt played a great part. Britain and Denmark used similar amounts and the agriculture of both countries depended a great deal on livestock fed with cheap imported feeding stuffs which provided large amounts of additional plant food from manurial residues. Part of this reached the land in farmyard manure but much was lost in drainage and probably a good deal less was lost in Denmark where much more trouble was taken to collect the liquid manure and apply it to the land. Before the war the whole of the United States used less fertilizer than Germany alone and over half was used in the Southern region, especially in the cotton States. The average rates in the New England States and in the Middle Atlantic region were much the same as in Great Britain and France respectively, and this reflects the general similarities in their

climates and types of agriculture. The Mid-West and Western regions use but little.

Since before the war the consumption of fertilizers in Britain has roughly doubled but the arable acreage has also increased very greatly and there is scope for a very considerable increase in the amounts which could profitably be used.

It is clear that fertilizers have been responsible for a vast increase in production and that a further large increase is possible by using larger quantities of fertilizers and using them more efficiently. Let us consider possible methods of achieving this.

1. Since the outbreak of war, fertilizers have been in short supply in many countries and there is great need for an increase in production. In order to encourage the use of fertilizers, by keeping prices at a low level, some governments have found it advantageous to subsidize them.

2. Efforts are needed to get the existing knowledge on the use of fertilizers across to the farmers by means of Advisory Services, and efficiency could be increased in many places by more field experiments and soil testing. The value of such work is greater where it can be interpreted as a soil survey.

3. Fertilizer surveys would provide information as to the present fertilizer practice and would indicate to the agricultural advisory services the areas and crops on which they should concentrate.

4. Less than 25 per cent of the phosphate and usually much less than 50 per cent of the potash and nitrogen applied to the soil can be accounted for in crops. In order to increase efficiency, methods of application of fertilizers require to be critically examined. Under certain circumstances, fertilizer placement, in which the most important advances have come from the United States, has been shown to be highly advantageous and should be more widely adopted. New and improved forms of fertilizers must also be sought.

Trace Elements

One of the most important and interesting advances made in recent years in the study of soil fertility is the recognition of the part played by what are termed the micro-nutrient, minor or trace elements. Deficiencies of these essential elements reduce the yield or impair the quality of crops, and, in some instances, the health of animals is affected. In many parts of the world, especially where agriculture is old and highly developed, micro-nutrient deficiencies are of secondary importance, affecting only small areas of land or occurring sporadically in some particular climatic conditions; for example, boron deficiency in Britain is serious only in drier seasons. However, they sometimes occur on the most productive soils—manganese deficiency is especially associated with organic soils which otherwise are very fertile. Elsewhere, deficiencies are so severe and widespread that the successful agricultural exploitation of large areas depends on the supply of the deficient element, for instance, copper and cobalt deficiencies in Australia and New Zealand, the former affecting both plants and animals, the latter only animals. In South Australia the addition of molybdenum has been found to be essential on acid podzolized soils for the establishment of subterranean clover. There are also cases of excesses of certain elements having detrimental effects on both plants and animals. Productivity could be increased in many regions if these deficiencies and excesses were corrected and with this aim in view surveys of where they occur are highly desirable.

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Fulton Bag & Cotton Mills, Atlanta, Ga.
Hammond Bag & Paper Co., Welisburg, W. Va.
International Paper Co., Bagpak Div., New York City
Jaite Company, The, Jaite, Ohio
Kraft Bag Corporation, New York City
Raymond Bag Co., Middletown, Ohio
St. Regis Paper Co., New York City

BAGS—Dealers and Brokers
Ashcraft-Wilkinson Co., Atlanta, Ga.
Huber & Company, New York City
McIver & Son, Alex. M., Charleston, S. C

BAG CLOSING MACHINES
St. Regis Paper Co., New York City

BAG PRINTING MACHINES
Schmutz Mfg. Co., Louisville, Ky.

BAGGING MACHINES—For Filling Sacks
Atlanta Utility Works, The, East Point, Ga.
St. Regis Paper Co., New York City
Sackett & Sons Co., The A. J., Baltimore, Md.
Sturtevant Mill Company, Boston, Mass.

BONE BLACK
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Huber & Company, New York City

BONE PRODUCTS
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Davidson Commission Co., The, Chicago, Ill.
Huber & Company, New York City
Jackle, Frank R., New York City
McIver & Son, Alex M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

BORAX AND BORIC ACID
American Potash and Chem. Corp., New York City

BROKERS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Davidson Commission Co., The, Chicago, Ill.
Huber & Company, New York City
Jackle, Frank R., New York City
Keim, Samuel D., Philadelphia, Pa.
McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

BUCKETS—For Hoists, Cranes, etc.
Hayward Company, The, New York City

BUCKETS—Elevator
Baughman Manufacturing Co., Jerseyville, Ill.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CARS AND CARTS
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CHEMICALS
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Commercial Solvents Corp., New York City
Davison Chemical Corporation, Baltimore, Md.
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
Lion Oil Company, El Dorado, Ark.
McIver & Son, Alex. M., Charleston, S. C.
Pittsburgh Agricultural Chemical Co. Pittsburgh, Pa.
Spencer Chemical Co., Kansas City, Mo.
Virginia-Carolina Chemical Corp., Richmond, Va.
Woodward & Dickerson, Inc., Philadelphia, Pa

CHEMISTS AND ASSAYERS
Gascoyne & Co., Baltimore, Md.
Shuey & Company, Inc., Savannah, Ga.
Wiley & Company, Baltimore, Md.

CONDITIONERS
Arkansas Rice Growers Corp. Assn., Stuttgart, Ark.
Jackle, Frank R., New York City
Keim, Samuel D., Philadelphia, Pa.
National Lime & Stone Co., Findlay, Ohio
Quaker Oats Company, Chicago, Ill.

COTTONSEED PRODUCTS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
Jackle, Frank R., New York City
McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

CYANAMID
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City

DRYERS
Sackett & Sons Co., The A. J., Baltimore, Md.

ENGINEERS—Chemical and Industrial
Chemical Construction Corp., New York City
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.
Titlestad Corporation, Nicolay, New York City

FERTILIZER (Mixed) MANUFACTURERS
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Davison Chemical Corporation, Baltimore, Md.
International Minerals & Chemical Corporation, Chicago, Ill.
Southern States Phosphate & Fertilizer Co., Savannah, Ga
Virginia-Carolina Chemical Corp., Richmond, Va.

FISH SCRAP AND OIL
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
Jackle, Frank R., New York City
McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

FOUNDERS AND MACHINISTS
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Machine Works, Aurora, Ind.

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Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

IMPORTERS, EXPORTERS
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Southern States Phosphate & Fertilizer Co., Savannah, Ga.
Woodward & Dickerson, Inc., Philadelphia, Pa.

INSECTICIDES
American Agricultural Chemical Co., New York City
Pittsburgh Agricultural Chemical Co. Fittsburgh, Pa.

LEAD BURNERS
Southern Lead Burning Co., Atlanta, Ga.

LIMESTONE
American Agricultural Chemical Co., New York City
Ashcraft-Wilkinson Co., Atlanta, Ga.
McIver & Son, Alex. M., Charleston, S. C.
National Lime & Stone Co., Findlay, Ohio

LOADERS—Car and Wagon
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Acid Making and Handling
Atlanta Utility Works, The, East Point, Ga.
Chemical Construction Corp., New York City
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Ammoniating
Sackett & Sons Co., The A. J., Baltimore, Md.
Sturtevant Mill Company, Boston, Mass.

MACHINERY—Elevating and Conveying
Atlanta Utility Works, The, East Point, Ga.
Baughman Manufacturing Co., Jerseyville, Ill.
Hough Co., The Frank G., Libertyville, Ill.
Hayward Company, The, New York City
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

MACHINERY—Grinding and Pulverizing
Atlanta Utility Works, The, East Point, Ga.
Bradley Pulverizer Co., Allentown, Pa.
Kent Mill Co., Brooklyn, N. Y.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

MACHINERY—Material Handling
Atlanta Utility Works, The, East Point, Ga.
Baughman Manufacturing Co., Jerseyville, Ill.
Hayward Company, The, New York City
Hough Co., The Frank G., Libertyville, Ill.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

MACHINERY—Mixing, Screening and Bagging
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.
Universal Vibrating Screen Co., Racine, Wis.

MACHINERY—Power Transmission
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Superphosphate Manufacturing
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

MANGANESE SULPHATE
McIver & Son, Alex. M., Charleston, S. C.

MINOR ELEMENTS
Tennessee Corporation, Atlanta, Ga.

MIXERS
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

NITRATE OF SODA
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.

NITROGEN SOLUTIONS
Lion Oil Company, El Dorado, Ark.
Spencer Chemical Co., Kansas City, Mo.

NITROGENOUS ORGANIC MATERIAL
American Agriculture Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Davidson Commission Co., The, Chicago, Ill.
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
Jackle, Frank R., New York City
McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

NOZZLES—Spray
Monarch Mfg. Works, Philadelphia, Pa.

PHOSPHATE ROCK
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Virginia-Carolina Chemical Corp., Richmond, Va.

PLANT CONSTRUCTION—Fertilizer and Acid
Atlanta Utility Works, The, East Point, Ga.
Chemical Construction Corp., New York City
Monsanto Chemical Co., St. Louis, Mo.
Sackett & Sons Co., The A. J., Baltimore, Md.
Southern Lead Burning Co., Atlanta, Ga.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.
Titlestad Corporation, Nicolay, New York City

POTASH SALTS—Dealers and Brokers
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
Jackle, Frank R., New York City

POTASH SALTS—Manufacturers
American Potash and Chem. Corp., New York City
Potash Co. of America, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
United States Potash Co., New York City

PRINTING PRESSES—Bag
Schmutz Mfg. Co., Louisville, Ky.

REPAIR PARTS AND CASTINGS
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

BUYERS' GUIDE

SCALES—Including Automatic Bagging
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

SCREENS
Atlanta Utility Works, The, East Point, Ga.
Link-Belt Co., Chicago, Ill.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.
Universal Vibrating Screen Co., Racine, Wis.

SEPARATORS—Air
Kent Mill Co., Brooklyn, N. Y.
Sackett & Sons Co., The A. J., Baltimore, Md.
Sturtevant Mill Co., Boston, Mass.

SPRAYS—Acid Chambers
Monarch Mfg. Works, Inc., Philadelphia, Pa.

SULPHATE OF AMMONIA
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
Jackle, Frank R., New York City
Lion Oil Co., El Dorado, Ark.
McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

SULPHUR
Ashcraft-Wilkinson Co., Atlanta, Ga.

SULPHURIC ACID
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Southern States Phosphate Fertilizer Co., Savannah, Ga.
U. S. Phosphoric Products Division, Tenne Corp., Tampa, Fla.
Virginia-Carolina Chemical Corp., Richmond, Va.

SUPERPHOSPHATE
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, G.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Davison Chemical Corporation, Baltimore, Md.
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
Jackle, Frank R., New York City
Southern States Phosphate Fertilizer Co., Savannah, Ga.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Virginia-Carolina Chemical Corp., Richmond, Va.

SUPERPHOSPHATE—Concentrated
Armour Fertilizer Works, Atlanta, Ga.
International Minerals & Chemical Corporation, Chicago, Ill.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Virginia-Carolina Chemical Corp., Richmond, Va.

TAGS
Keener Mfg. Co., Lancaster, Pa.

TANKAGE
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Davidson Commission Co., The, Chicago, Ill.
International Minerals & Chemical Corporation, Chicago, Ill.
Jackle, Frank R., New York City
McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

VALVES
Atlanta Utility Works, The, East Point, Ga.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

Alphabetical List of Advertisers

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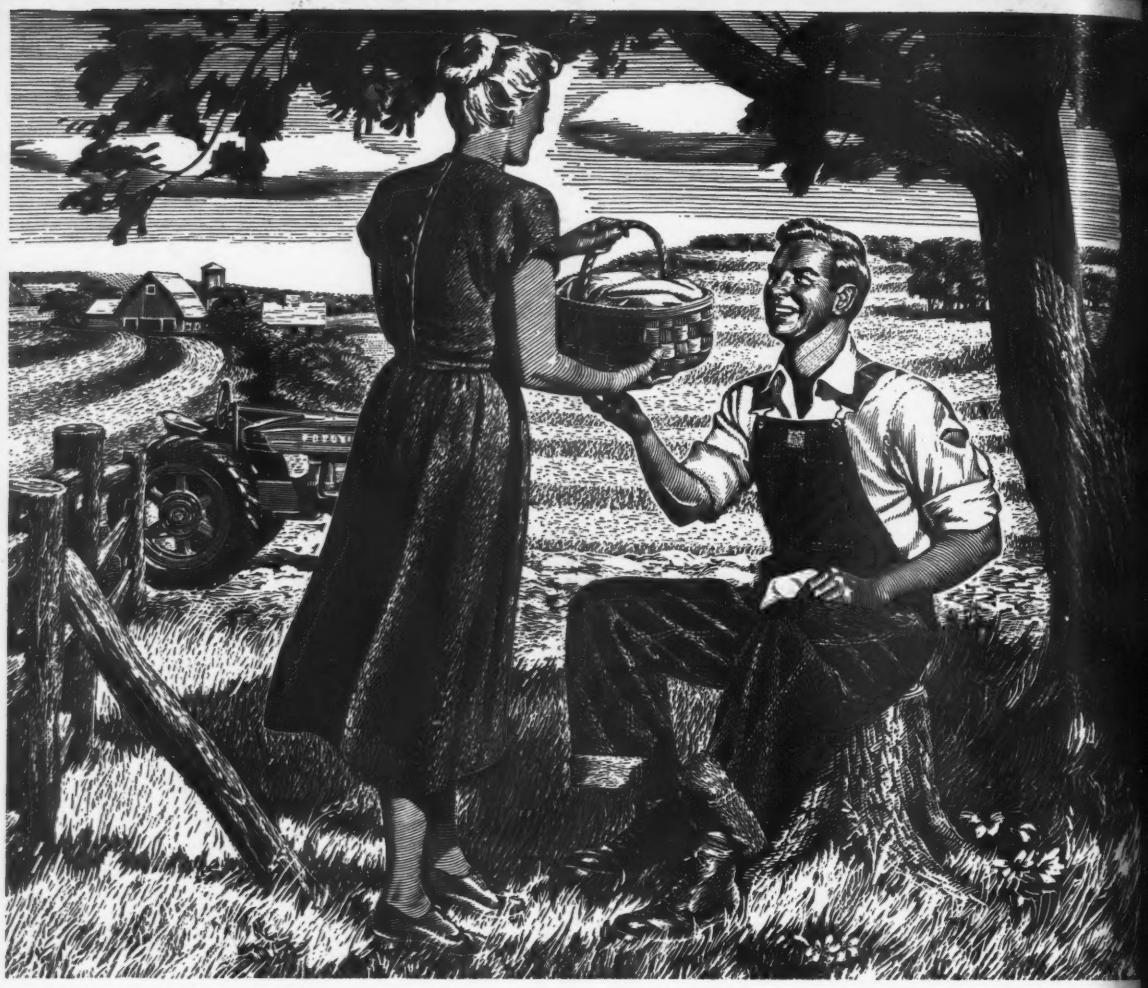
CARLSBAD, NEW MEXICO

GENERAL SALES OFFICE . . 50 Broadway, New York, N. Y. • MIDWESTERN SALES OFFICE . . First National Bank Bldg., Peoria, Ill.
SOUTHERN SALES OFFICE . . Candler Building, Atlanta, Ga.



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